Stormwater Reuse Calculations

Objective: Estimate the annual load of stormwater (and percentage of total if not 100%) not discharged because used for irrigation as credit for total nitrogen, total phosphorus, or both.

1. The weighted runoff coefficient (C) is is the sum of each runoff coefficient for a surface (C) times the area of the surface (A) divided by the total area.

$$C = \frac{C_1 A_1 + C_2 A_2 + \ldots + C_N A_N}{A_1 + A_2 + \ldots + A_N}$$

where: C_N = Runoff coefficient for surface N (see **Appendix B** for values of *C*)
A_N = Area of surface N

2. The equivilent impervious area (EIA)(in acres) is equal to the weighted runoff coefficient (C) times the area of the watershed (in acres) (A). Note that the EIA for a watershed includes the area of the pond, using this methodology.

$$EIA = C \bullet A$$

The EIA is the area of completed impervious watershed that would produce the same volume of runoff as the actual watershed and serves to generalize the model so that it can be applied to a watershed of any size and runoff characteristics or applied to a volume of water used.

3. Determine use rate (R) and runoff storage volume over the EIA (V) to find E (average efficiency).
    a. R = Use rate (depth of use in inches times the EIA; volume term).
    b. E = Yearly discharge volume average efficiency (curves).
    c. V = Runoff storage volume of the pond, expressed in inches over the EIA.
4. Importation assumptions when using the REV curves include:
    a. Net groundwater movement into or out of the pond is assumed to be zero over the period of simulation.
    b. The use rate is kept constant for each month in a year, and presented on the REV curves as an average rate per day over the EIA.
    c. The effectiveness results are long term averages based on historical rainfall records. The average values for each year will be different because of variability in annual rainfall volumes and distribution.
    d. Soil storage in the irrigated area and plant evapotranspiration are not limiting irrigation application rates.
5. Determine the metereological zone for the project site to select the appropriate REV chart for the location.

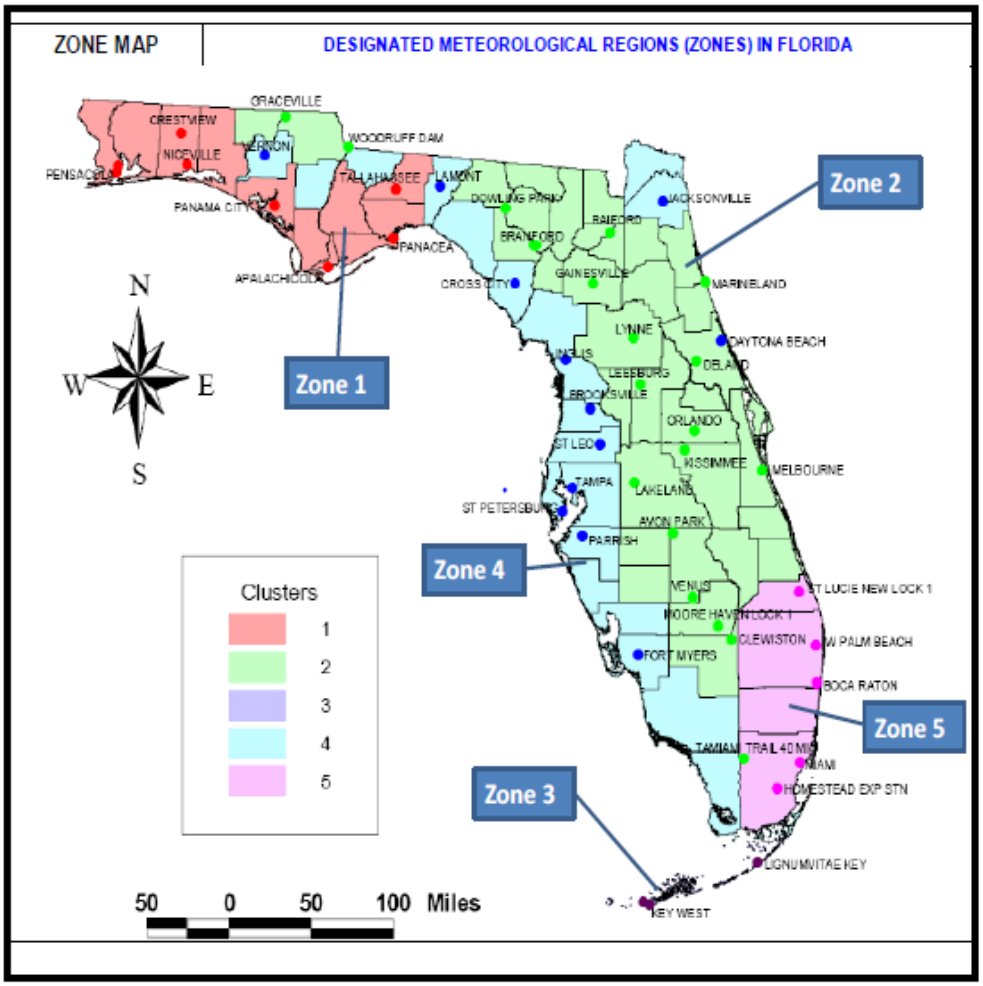
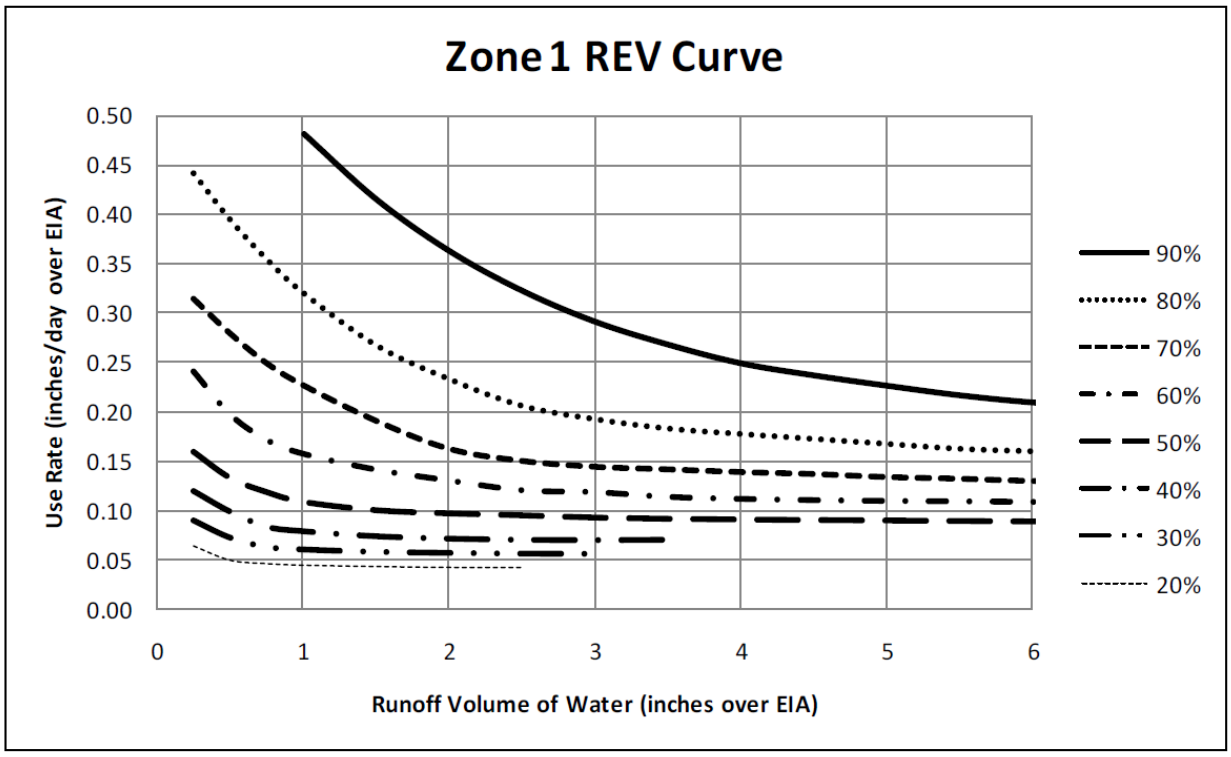


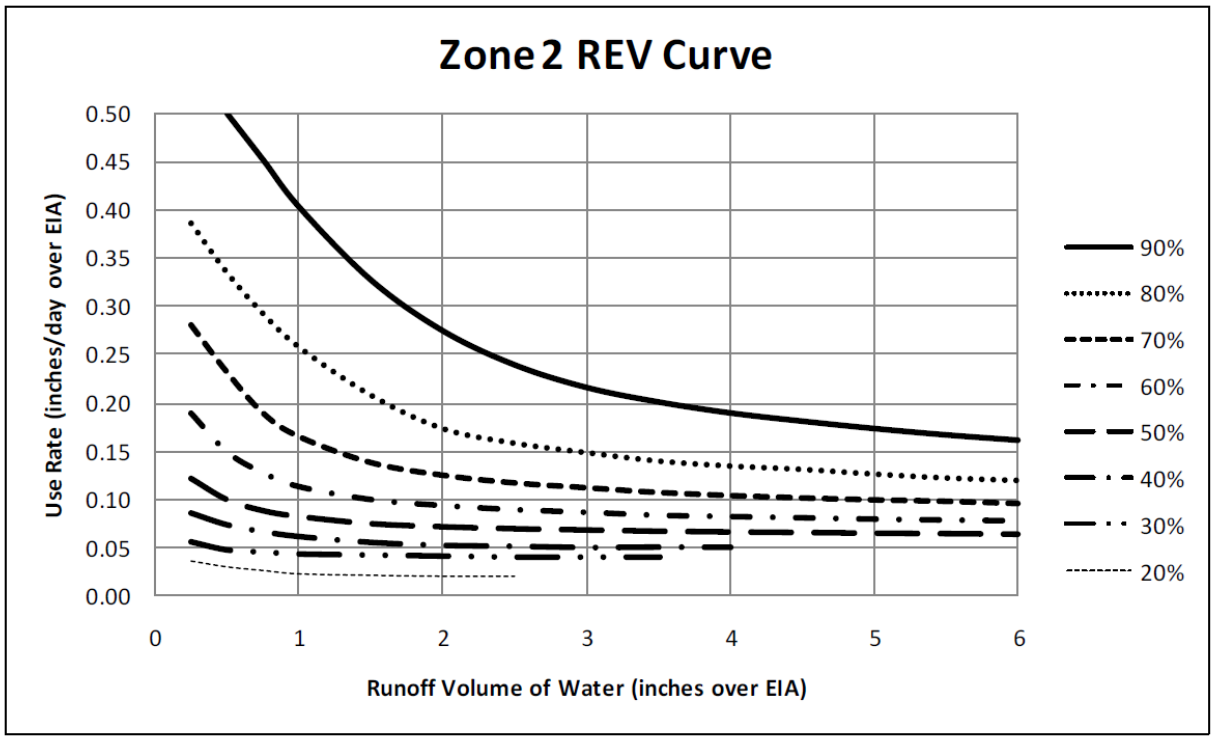
Figure 38 – Meteorological Zone Map Description

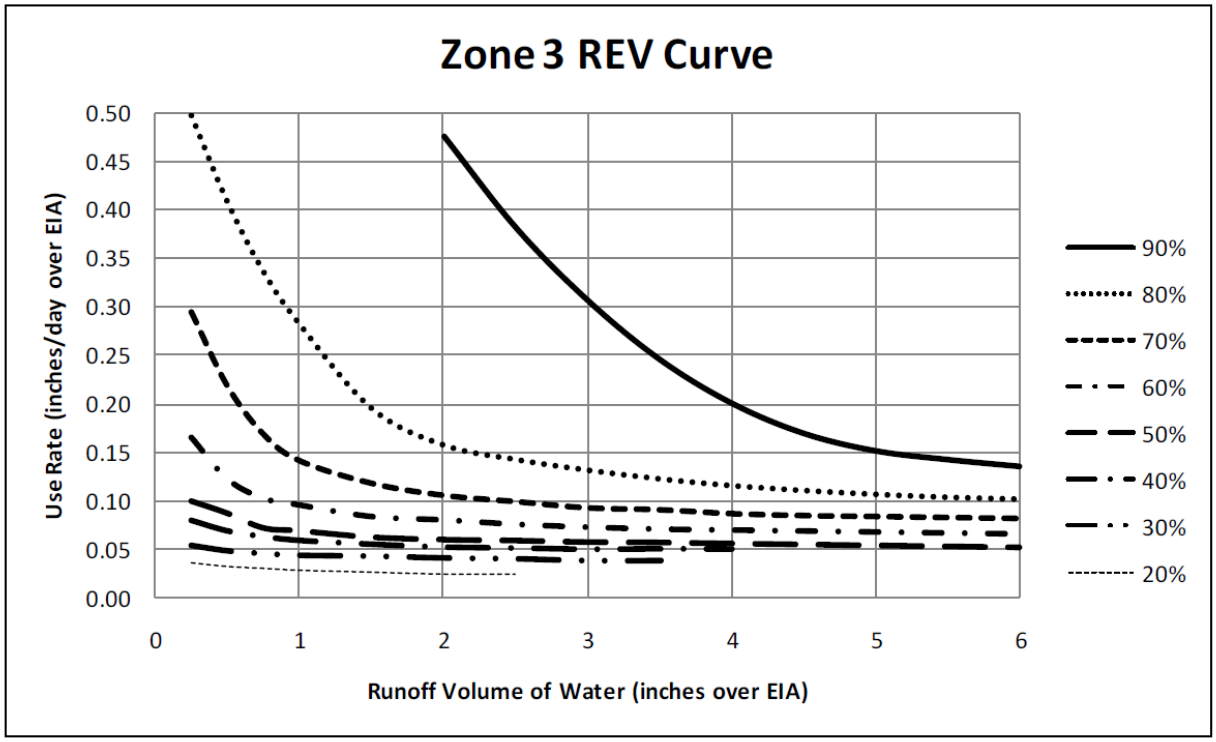
Map of the five meteorological regions used for stormwater management. This project tested multiple co-mingling scenarios for each region. Source: UCF

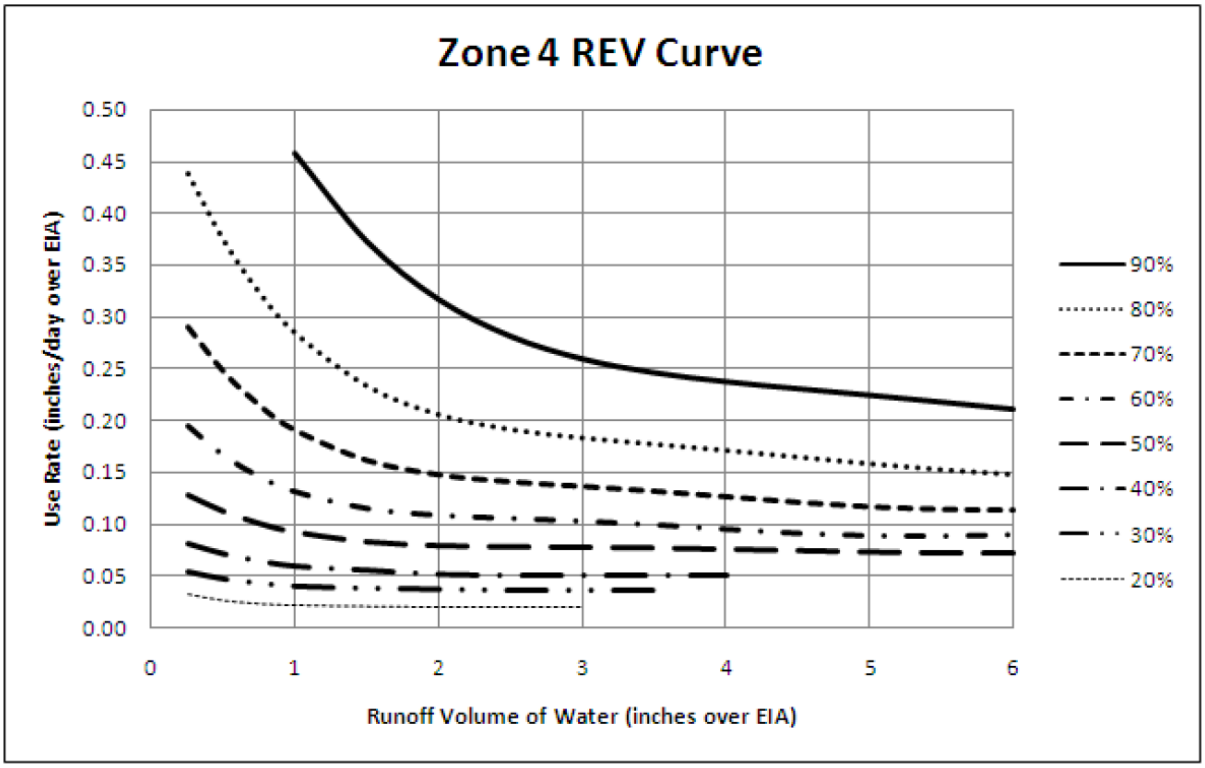
From: https://fdotresearch.com/2019/07/15/better-together-stormwater-facilities-target-more-than-roadway-runoff/, June 25, 2020.

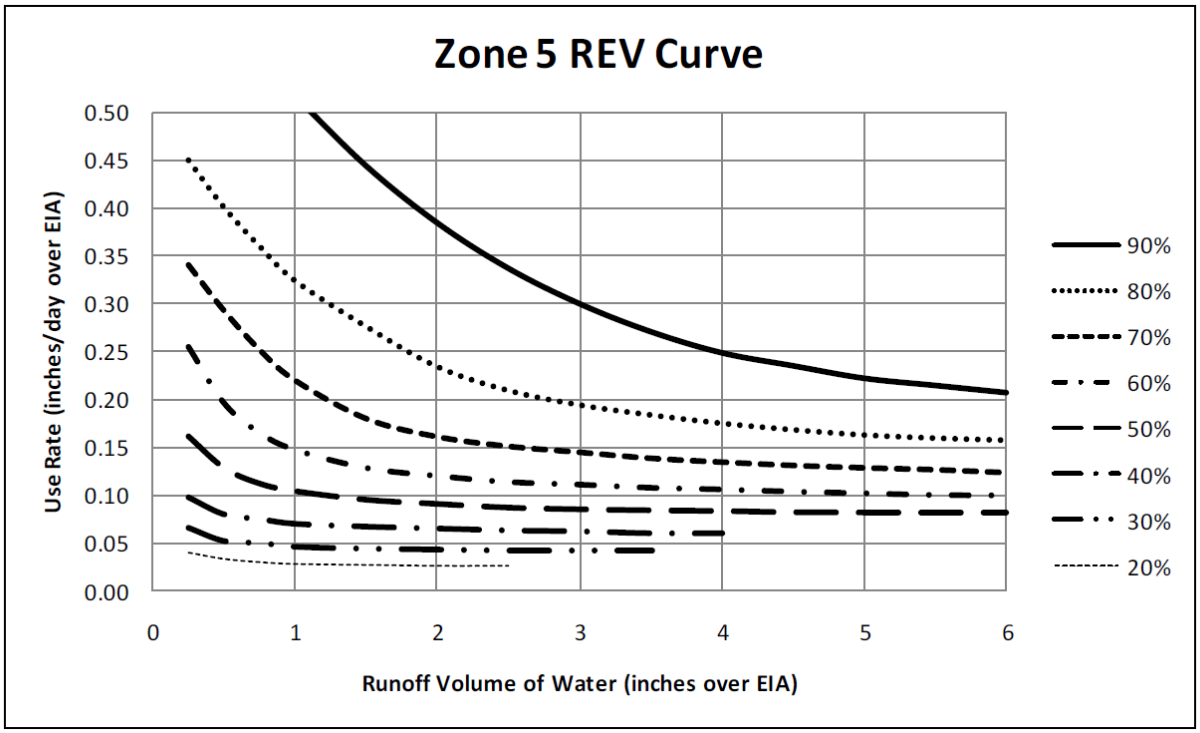
6. Based on the zone for the site locaton, review the correct REV chart and select the correct curve based on use rate and runoff storage volume over EIA for the efficiency level (in percentage). Extrapoloation between effectiveness lines for a given runoff storage volume on a linear basis is reasonable. The yearly discharge volume average efficiency demonstrated by the selected curve is the percentage that should be applied to the starting load of the treated area for the credit amount or the percent efficiency used in a treatment train calculation. If applied in a springshed for nitrogen credit to groundwater, the appropriate attenuation and recharge factors should be applied for an estimate of the improvement in load to groundwater.


Zone 1 REV Curve
Use Rate (inches/day over EIA)
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0
1
2
3
4
5
6
Runoff Volume of Water (inches over EIA)
90%
80%
70%
60%
50%
40%
30%
20%


Zone 2 REV Curve
Use Rate (inches/day over EIA)
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0
1
2
3
4
5
6
Runoff Volume of Water (inches over EIA)
90%
80%
70%
60%
50%
40%
30%
20%


Zone 3 REV Curve
Use Rate (inches/day over EIA)
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0
1
2
3
4
5
6
Runoff Volume of Water (inches over EIA)
90%
80%
70%
60%
50%
40%
30%
20%


Zone 4 REV Curve
Use Rate (inches/day over EIA)
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0
1
2
3
4
5
6
Runoff Volume of Water (inches over EIA)
90%
80%
70%
60%
50%
40%
30%
20%



REV Curves based on DEP, Draft Stormwater Quality Handbook, March 17, 2010, Figures 15.4 to 15.8.